The Subterrane

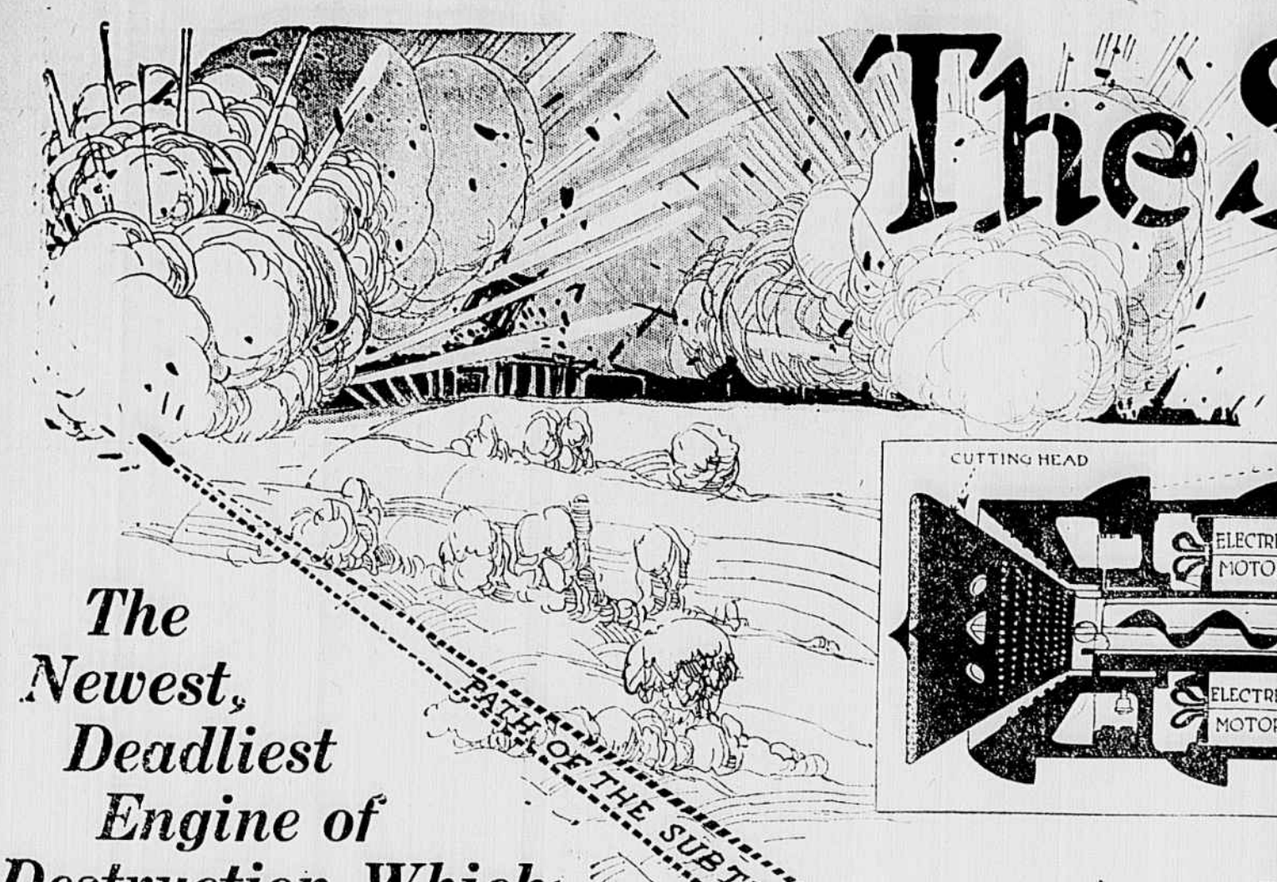
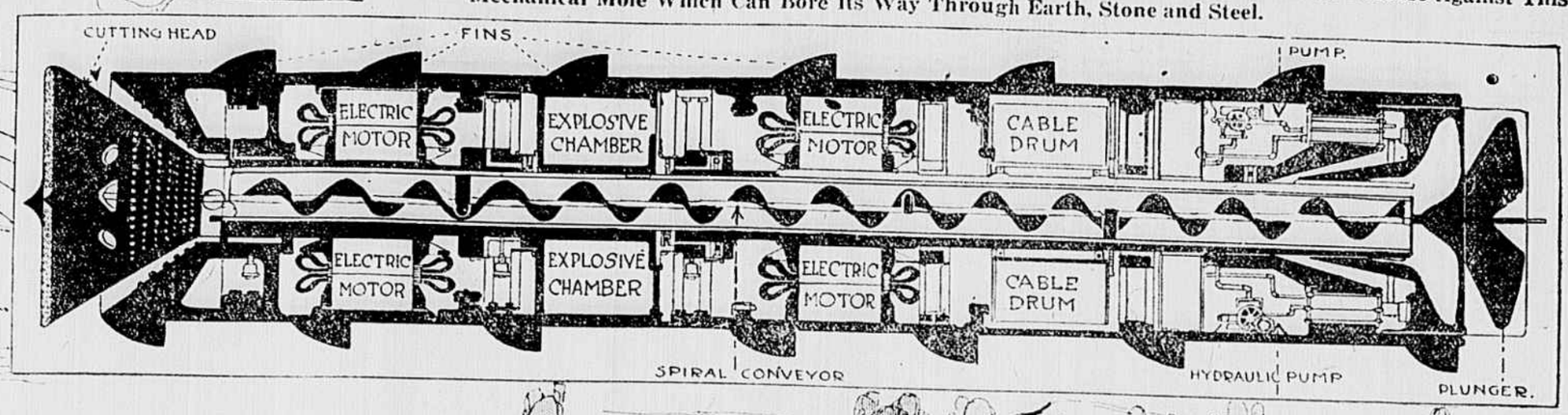
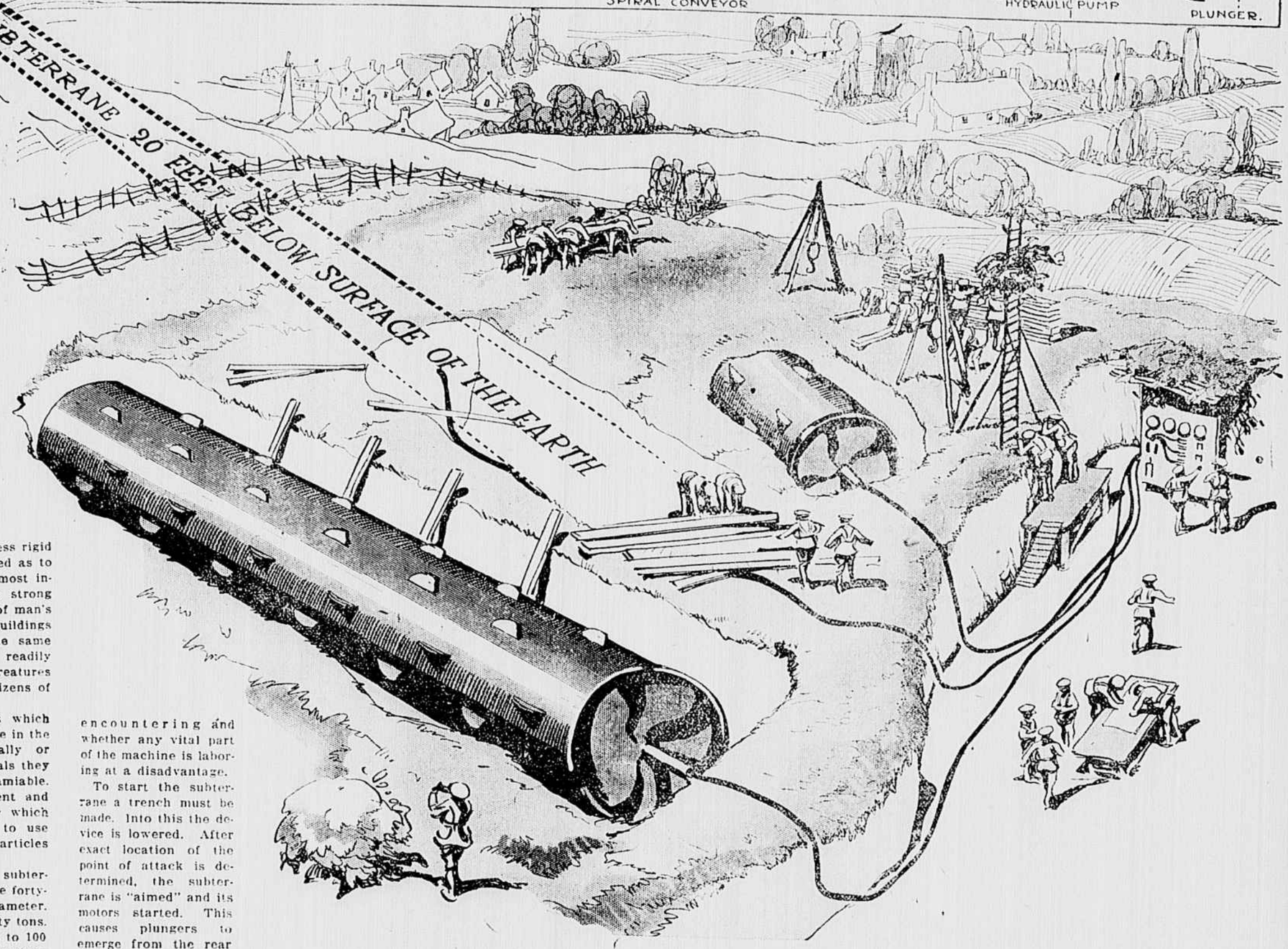


Diagram Showing a Plan of the New Subterrane, and Below a Pictorial Sketch Showing How the Deadly Device Will Be Used in Actual Warfare. In the Foreground Are Shown Two of the Mechanical Monsters Ready to Start on Their Errand of Destruction, While a Third One Has Already Burrowed Its Way Into Enemy Territory and Is Depicted in the Act of Exploding. One of the Principal Features of This New Instrument of Death Is the Fact That the First Inkling the Enemy Would Have of Its Arrival Would Be the Cataclysmic Explosion Which It Would Effect. There Is no Possible Means of Defense Against This Mechanical Mole Which Can Bore Its Way Through Earth, Stone and Steel.





The Newest, Deadliest Engine of Destruction Which Cuts Its Way Through the Ground as a Submarine Travels Through the Ocean and Is Powerful Enough to Blow Up a Whole City!

A REMARKABLE instrument of destruction, which will work its way through the earth just as a torpedo travels through the sea, has been invented by an American engineer and is now being considered by the French Government.

The new device is called the "subterrane." Its sole function is to worm its way into enemy territory and to explode upon arriving at its destination. Nothing ordinarily found in the earth will stop it. It will eat its way through earth, clay, sand, chalk, loose rock, soft stone, bedrock, concrete and even steel. No fort yet constructed is strong enough to resist this ingenious engine of destruction, for its explosive chamber has a capacity of 400 cubic feet and could carry sufficient explosive to destroy a city.

The subterrane is a mechanical and automatic sapper and miner. In the present conflict, in which trench warfare plays such an important part, the engineering feats of the human sappers and miners, who burrow their way through the earth and explode their mines under enemy positions, have been of enormous value, but they have been attended with great danger. The subterrane will operate on a far more extensive scale without any danger to those who employ it.

The inventor of the device is Clifford P. Marye, a well-known New York engineer. The present war suggested to Mr. Marye that the belligerent who had a means for making rapid progress underground would have a tremendous advantage, and he set about to devise the necessary apparatus. The problem presented was to construct an engine which would propel itself through the earth in the same way as a ship makes its way through water, a submarine under water and an aeroplane through the air.

Mr. Marye considered the development of navigation through sea and air. In both cases, he found, man has simply followed nature.

"In propelling a vessel through water," explained Mr. Marye, "the primitive oar simulates the action of the fins of a fish. The subsequent development of the paddle-wheel and the screw propeller were but amplifications of the same basic principle—the fish's fin was converted into a rotary motion by the brain of man.

"It was the same way with the conquest of the air. The first experimenters studied nature's laws and designed machines which simulated the flight of the bird whose native element is the air. Then man improved on his model and enormously outstripped the bird in speed and endurance by making his propulsion rotary.

"In approaching the subject of propulsion underground, bearing in mind what had been done on the water, under the water and through the air, I went to nature for my instruction and from nature I got my inspiration. By simulating the propulsive operations of the earth creatures and rendering these propulsive operations in a rotary manner I produced the subterrane."

One of the characteristics of the earth which suggested to Mr. Marye the feasibility of the subterrane is the fact that while in the mass it is more or less rigid and inflexible, when it is analyzed as to its individual particles, it is a most inconstant element. True, it is strong enough to form the foundations of man's most stable work—his bridges, buildings and other structures, but at the same time, it is weak enough to be readily penetrated by such innocuous creatures as worms and other natural denizens of the underground.

While the individual particles which constitute the earth are formidable in the mass, when attacked individually or in small aggregations of individuals they become docile, flexible, even amiable. They yield to scientific treatment and eventually furnish the means by which we are able in the subterrane to use small aggregations of individual particles to penetrate the mass.

Now for a description of the subterrane. It is a torpedo-shaped device forty-two feet long and eight feet in diameter. It is made of steel and weighs forty tons. It travels at a rate of from 5 feet to 100 feet per hour, depending upon the nature of material encountered. No man accompanies it.

Electric power for operating the subterrane is supplied from a power station located anywhere at a convenient distance, probably from some nearby town, through the ordinary means of transmission. At the switchboard, connection is made with a cable which is carried on a drum within the subterrane. This cable is paid out as the subterrane advances. As the cable is paid out it engages a mechanism which registers the forward progress of the device, and this record of progression is electrically indicated on a dial at the switchboard.

On the outside shell of the subterrane are located fins of convenient shape and conformation to prevent the rotation of the device itself. These fins are provided in greater number than are necessary to prevent rotation of the subterrane, because they will be subjected to great stresses and many of them will be torn from the shell as it advances through the mass. If only a few or these remain in place, their purpose will be accomplished.

In a general way, the operation of the Marye subterrane may be described as attacking the earth in individual particles, taking these particles inside itself, digesting them and then evacuating the mass to the rear, using the ejected mass as a wall of resistance against which plungers operate to urge the device forward.

The device is equipped with a number of microphones placed at vital points in its structure. Their purpose is to enlighten the operator, who is watching and controlling the progress of the subterrane, just what is going on, what obstacle it is encountering and whether any vital part of the machine is laboring at a disadvantage.

To start the subterrane a trench must be made. Into this the device is lowered. After exact location of the point of attack is determined, the subterrane is "aimed" and its motors started. This causes plungers to emerge from the rear of the subterrane, and when contact is established between the face of the plungers and the rear wall of the trench the subterrane moves forward.

At this time the motor actuating the cutting head, the device whose rotation cuts its way through every obstacle is started. The instant the revolving cutting head comes in contact with the forward face of the trench it shreds the mass, which is conveyed as muck through the subterrane itself and deposited to the rear of the machine. This muck is compressed by hydraulic rams and furnishes the necessary resistance to urge the subterrane forward. The various functions of the device are at all times under the control of the operator at the central station, who is advised electrically of what is going on.

While the rate of progress is comparatively slow, as much as half a mile can be covered in a day. The maximum distance the device will travel is not yet known. A minimum of five or six miles is assured. Much depends upon the skill of the engineer in charge, his knowledge of the terrain traversed and the physical conditions encountered.

There is no surface indication of the progress of the subterrane. No explosive or detonator is used in propulsion. Its progress is noiseless. No bore, orifice or tunnel is left behind. It goes into the earth and the earth closes in behind it. It will not operate above ground. If by accident or intention it be operated in the direction of the surface it would completely emerge from the earth and come to rest.

When the subterrane reaches its destination—a fact made known to the operator by a computation of the distance travelled—it is detonated. This, of course, results in the destruction of the device itself, but that would be a trifling loss compared with the damage it would inflict upon the enemy. The first subterrane for use in warfare would cost $48,000 to construct, but they might be built in numbers for about $12,000 each.

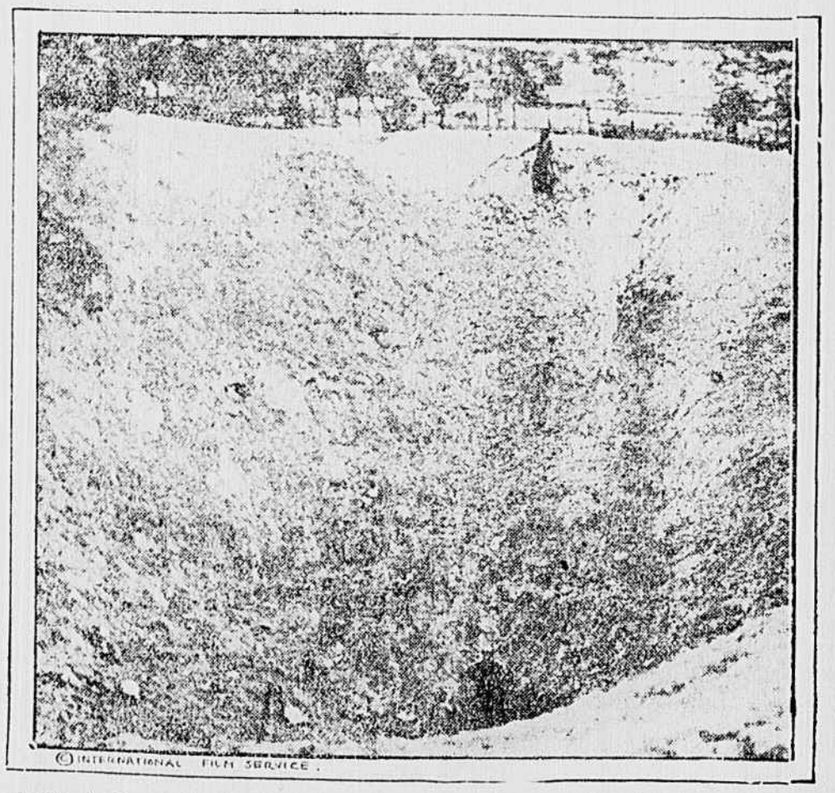
"The practical value of the subterrane," declared Mr. Marye, "is that if offers a safe means, so far as its operators are concerned, by which enemy trenches, forts, positions and even cities may be destroyed. This would be done in a manner and by means which would leave the enemy absolutely no method of defense against the attack. The first the enemy would know of the arrival of the subterrane would be the cataclysmic explosion which it would effect.

"Even if the enemy knew operations of the kind were under way there is no known method of defense. Flight alone could save the garrison or the inhabitants of the city attacked.

"Depths can be attained by the subterrane that are not possible by any other method in the time at disposal. There is a limit to the depth at which sappers and miners can operate, but the subterrane may be started on its destructive mission at any depth that may be necessary.

Mr. Marye has made two practical tests of the subterrane. The first occurred on December 13, 1914, when a somewhat crude model was tried in sand. It answered all the expectations of its inventor. An improved model was tried in July, 1915, in the hills of Staten Island, N. Y. It worked its way through sand, earth, clay, impregnated with boulders, loose rock, roots of trees and other natural obstacles. It worked so well that the model was lost after it had traversed some hundred feet.

The subterrane was submitted to the French Government two or three months ago. The Minister of Invention is now giving it serious consideration, as it is generally realized that its perfection may prove to be a decisive factor in the present European war.



A "Crater" on the French Front Produced by a Mine. The Subterrane's Explosive Force Is Many Times That Which Produced This Enormous Hole.